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THE FOSSIL PELECINIDS *PELECINOPTERON* BRUES AND *ISCOPINUS* KOZLOV (HYMENOPTERA: PROCTOTRUPOIDEA: PELECINIDAE)

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Abstract.—The status of the two described genera of fossil Pelecinidae is reviewed. The type material of *Pelecinopteron tubuliforme* Brues has apparently been lost or destroyed. A single partial male specimen from Paleocene amber is known. On the basis of this specimen and the illustrations in the original description, the placement of *Pelecinopteron* within the Pelecinidae is corroborated. Synapomorphies uniting the two are an extremely elongate, tubular female metasoma; basal segment of the hind tarsus shorter than second segment; hind tibiae of female swollen; Rs with two long branches. The association of the lower Cretaceous species *Iscopinus baissicus* Kozlov with Pelecinidae is not supported. The purported branch of Rs_2 is interpreted as the crossvein r-m, a plesiomorphic feature. The subfamily Iscopininae is removed from Pelecinidae and considered as the family Iscopinidae **new status** within Proctotrupoidea *s. str.*

Key Words: Cretaceous, Jurassic, Eocene, Paleocene, paleontology

The family Pelecinidae (Hymenoptera: Proctotrupoidea *s. str.*) today consists of only a single extant genus, *Pelecinus* Latreille. No fossils of *Pelecinus* are known, but two other genera have been assigned to the family: *Pelecinopteron* Brues and *Iscopinus* Kozlov. As part of a review of pelecinids, I have re-examined these fossil taxa and discuss their relationship with modern *Pelecinus*.

The superfamily Proctotrupoidea *s. str.* (Hymenoptera) is comprised of some ten distinctive extant families. Of these, only the Diapriidae and Proctotrupidae contain large numbers of species. The remainder are small, probably relict taxa. However, the fossil history of the superfamily is relatively rich, with 70 species described and the extinct family Mesoserphidae represented already in the lower Jurassic (Darling and Sharkey 1990, Rasnitsyn 1980, 1990, 1994).

Modern *Pelecinus* are characterized by a number of distinctive apomorphic characters among living Hymenoptera (terminology of wing veins and cells follows Goulet and Huber 1993): Rs of the fore wing is branched (see more extensive discussion of this feature below); the female metasoma is extremely elongate, with the lateral edges of the terga of metasomatic segments 2–5 meeting and fused together along the midventral line, the sterna of these segments are divided into anterior and posterior sclerites allowing rotational movement (Mason 1984); the hind tibiae of the female are apically swollen and bear a lateral orifice; and the hind basitarsi of both sexes are strongly reduced, shorter than the second segment. The limits of the family traditionally have been based upon these characteristics of the extant species. Incorporation of fossil taxa into a monophyletic Pelecinidae requires some relaxation of these defining characteristics.

Pelecinopteron tubuliforme Brues
(Fig. 1)

Pelecinopteron tubuliforme Brues, 1933: 20, ♂, ♀.

Pelecinopteron tubuliforme: Kozlov, 1974: 145.

Brues described this species on the basis of three specimens, one female (the holotype) and two males, from Eocene Baltic amber. This material was part of a much larger collection of specimens belonging to the University of Königsberg (present-day Kaliningrad, Russia) that formed the basis for a series of papers published over a period of 18 years (Brues 1923, 1933, 1940a, 1940b, 1940c). I have had no success in locating the specimens of *Pelecinopteron* from this material. It is quite possible that it was destroyed during World War II, but it is unclear when, or if the specimens were ever returned. Unfortunately, many of the specimens had no identification numbers associated with them, rendering their recognition even more difficult. All that is available for many of these taxa are the published descriptions and illustrations.

These sources of information appear to support the placement of *P. tubuliforme* within the Pelecinidae. In a comparison with *Monomachus* Klug, Brues (1933) characterized the wing venation as "Pelecinus type," presumably referring to the lack of closed cells and most venation in the hind wing, and the long apical branches of Rs in the fore wing. These branches follow a very similar course to those in *Pelecinus*, and Brues also remarked that the veins are "hyaline and scarcely chitinized." The long tubular metasoma is very similar to that of *Pelecinus*, although Brues remarked that segments 1–3 possessed large sterna. He emphasized the short fourth segment of the hind tarsus, but his illustration (Plate 3, Fig. 8) also appears to show that the basal segment is relatively short. The supposed male of *Pelecinopteron*, however, differs rather markedly from male *Pelecinus*. The metasoma (Fig. 1) is elongate rather than clavate, and the fifth segment (according to Brues) is swollen medially and followed by a falcate sixth segment. The published illustration of the wing venation differs rather markedly between the male and female. On the basis of this evidence, Kozlov (1974) was quite justified in treating *Pelecinopteron* as a pelecinid.

In a footnote to his paper on *Iscopinus* (see below), Kozlov (1974) mentioned a specimen of *Pelecinopteron* in Paleocene amber from Sakhalin Island. This specimen (Fig. 1) consists of a detached male metasoma of eight visible segments and exserted genitalia and is remarkably similar to the illustration in Brues. The swollen and laterally compressed segment is metasomatic segment six (not five). The difference in position of the segments between the published illustration and this specimen suggests that the segments are capable of extensive movement. The male genitalia are quite narrow, with elongate parameres and the aedeagal lobe extends a considerable distance beyond the digiti. Each metasomatic segment is clearly divided into terga and sterna. Despite the lack of head, mesosoma, and appendages I am quite comfortable confirming Kozlov's determination of this as a specimen of *Pelecinopteron*.

Material examined.—"PIN No. 3387/4; Pelecinopteron ?tubuliforme Brues, M. Kozlov det., 1972 (Paleont. Zhurn. 1974 #1:145); Sakhalin amber (Paleocene), V. V. Zherikhin leg., 1972 (data from specimen)." Kozlov (1974) adds the following information: " . . . material washed ashore at the settlement of Starodubskoye (Dolinsk district, Sakhalin province)."

Iscopinus baissicus Kozlov
(Figs. 2, 4)

Iscopinus baissicus Kozlov, 1974: 145. Holotype in Paleontological Institute, Russian Academy of Sciences, Moscow.

Total length.—13.2 mm.

Head.—Width 1.77 mm, height 1.97 mm (measured to lower tip of mandibles); ratio

Figs. 1–2. Specimens of fossil Pelecinidae. 1, *Pelecinopteron tubuliforme*, lateral view of metasoma; scale line = 2 mm. 2, *Iscopinus baissicus*, holotype.; scale line = 5 mm.

of height to width = 1.1; occipital carina incomplete, apparently not extending ventrally to base of mandibles or to merge with hypostomal sulcus; both hypostomal and genal bridges lacking, labium extending dorsad to occiptal foramen; hypostomae paralleling labium and extending quite far dorsally, not approximated medially; mandibles overlapping, large, both tridentate, teeth acute, subequal in size, arrayed vertically; clypeus transverse, with small apical protuberance; width = 1.13 mm, measured at level of anterior tentorial pits laterally to mandibular articulations; height = 0.33 mm; ratio of width to height = 3.4; frons appears to be slightly protuberant above, with medial longitudinal keel; no antennal insertions visible in lower half of frons.

Antennae.—8 and 17 antennomeres visible; longest antenna broken, with apical portion composed of 12 antennomeres; basal segment of longest antenna not modified into an identifiable scape; apical antennomere rounded, slightly shorter than preceding segment; third segment the longest, but overall antennae are filiform, with no differentiated clava.

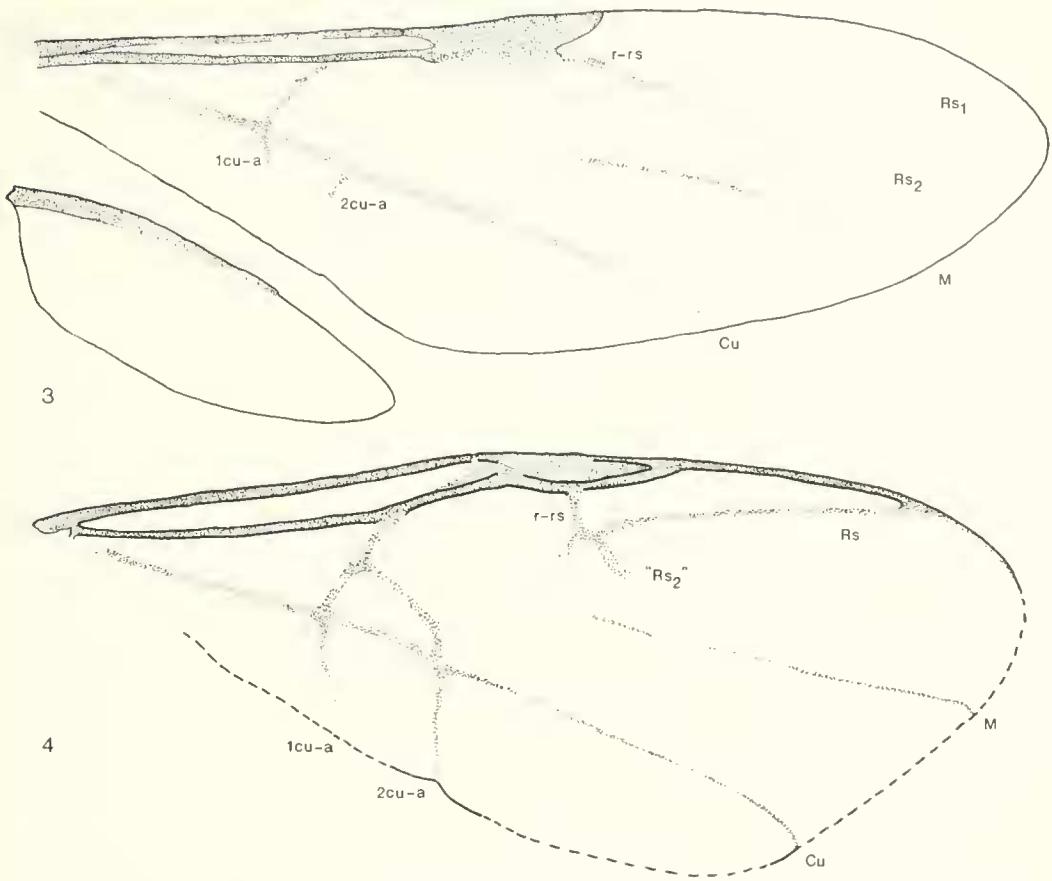
Mesosoma.—Length = 3.5 mm; pronotum appears to reach posteriorly to tegula, narrowed dorsally, but with short "neck" extending toward head; mesoscutum with narrow, transversely fusiform prescutum; central disk of mesoscutum with complete notauli, these converging, but not fusing posteriorly, transscutal articulation complete, narrow; behind transscutal articulation with medial transverse depression; scutellum strongly convex, delimited anteriorly by deeply crenulate furrow; axillae broadly separated medially; surface of propodeum apparently quite rugulose; mesopleuron with deep femoral scrobe, mesepimeron narrow, fusiform, delimited by deep crenulations; all legs gracile; hind basitarsus elongate.

Wings (Fig. 4).—Fore wing length = 7.1 mm; cell C present; pterostigma narrow, elongate, width = 0.27 mm, length = 1.68 mm, ratio of length to width = 6.53; radial cell ($2R_1$) closed, narrow, length = 2.52 mm, width = 0.54 mm, ratio of length to width = 4.70; Cu more or less straight and continuous to wing margin; M extends from wing margin basad beyond apex of r-rs; r-rs arising obliquely from pterostigma, 0.30 mm in length; Rs continues apically to wing margin from apex of r-rs, with short vein ("Rs_2") arising posteriorly, length of Rs_2 = 0.26 mm; Rs basad of intersection with r-rs extending posteriorly and fading, with weak indication of extending as far as to intersect M; cell 1M large, more or less 4-sided, apex much shorter than basal side; 1cu-a arising opposite first free abscissa of M; 2cu-a arising opposite m-cu; 1cu-a and 2cu-a more or less parallel, posterior ends apicad of intersections with Cu; hind wing not clearly visible.

Metasoma.—8 segments visible; apex of abdomen without recognizable genitalia; segment 1 strongly narrowed anteriorly, trapezoidal, basal width = 0.39 mm, apical width = 1.34 mm, medial length = 1.46 mm, ratio of length to greatest width = 1.09; following 5 segments subequal in size, slightly wider than long.

Material examined.—Holotype: "Paleontological Inst. AN SSSR; Iscopinus baissicus Kozlov, 1974; P. Zh., n. 1, 1974, pg. 145, fig. 1; holotype; No. 1989/2596±; Locality: Buryatskaya ASSR, Yeravnenskii area, left bank of Vitim R., below mouth of Baysa River; Coll. Zabaikalskii Branch, PIN, 1964."

This species was described on the basis of a single fossil specimen, both an upper and lower impression, from lower Cretaceous deposits in the Transbaikal region of eastern Russia. Kozlov assigned the species to Pelecinidae on the basis of the wing venation, which he simply described as being unique in the Hymenoptera. Presumably, he referred to the presence of the short vein arising posteriorly from Rs just beyond r-rs, the so-called Rs_2 (Fig. 4). Rasnitsyn (1980) reviewed the definition and relationships of pelecinids and published a more detailed illustration of *Iscopinus*. He con-



Figs. 3–4. Wings of Pelecinidae. 3, Fore, hind wing of *Pelecinus polyturator*; fore wing length = 13.9 mm. 4, Fore wing of *Iscopinus baissicus*; length = 7.1 mm. Dashed line in wing margin represents interpreted edge of wing (not observable in specimen).

cluded that its differences from *Pelecinus* and *Pelecinopteron* were so fundamental as to warrant the establishment of a separate subfamily, Iscopininae.

Both Kozlov and Rasnitsyn identified the branching of the apical portion of Rs as the only character defining the Pelecinidae. In *Pelecinus* (Fig. 3) Rs is a nebulous vein (Mason 1986), indicated only by a line of darker pigmentation. The anterior branch reaches the apex of the fore wing, curving away from the costal margin. The posterior branch curves toward the costal margin and is quite long, but only rarely reaches the wing margin. The posterior "branch" of Rs of *Iscopinus* is quite short, and it is impossible to determine if it is a tubular vein. Rasnitsyn (1980) noted several living examples of Hymenoptera in which Rs_2 is present as either a nebulous or tubular vein and concluded that this feature is a commonly occurring secondary formation. Remarkably, he continued to employ it as a means of defining pelecinids! He also cited the elongate abdomen and the lack of a long, exposed ovipositor as characters allying the *Iscopinus* with Pelecinidae. The metasoma of this specimen clearly is not elongate on the scale observed in either *Pelecinus* or *Pelecinopteron*. Further, the apex of the abdomen of the specimen is not clearly preserved. A reasonable argument can be made that this specimen is, in fact, a male.

It appears that the Rs_2 visible in the type of *Iscopinus* is identical with the crossvein r-m (probably 2r-m). This forms the apical side of the areolet of many Ichneumonoidea and is fully developed in the middle Jurassic *Beipiaosirex parva* Hong, placed in the Roproniidae (Proctotrupoidea) by Rasnitsyn (1994). The illustration of an undescribed Cretaceous specimen attributed to Mesoserphidae in Darling and Sharkey (1990, their Fig. 5) also has the suggestion of a short posterior branch arising from Rs. In *Iscopinus* the vein is either incomplete, i.e. not reaching M, or the venation in that part of both wings of this specimen has been destroyed. I suspect the former to be true, as traces of M are visible below the base of the apical abscissa of Rs. Is it the same vein that is expressed in *Pelecinus*? Rasnitsyn's argument that the so-called Rs_2 in extant insects is a secondary development, especially associated with species of large body size, has a good deal of merit to it. The possession of the crossvein r-m seems to be best interpreted as a plesiomorphic character. Thus, I find no evidence supporting the purported relationship of *Iscopinus* with the Pelecinidae.

How should *Iscopinus* be treated? It seems reasonable to continue to consider it to belong to the Proctotrupoidea *s. str.* by virtue of the presence of cell C, the lack of the areolet, the elongate and narrow cell 2R1 (radial cell), the straight Cu, and the basal position of cell 1M. The name Iscopininae Rasnitsyn is a valid family-group name and I believe it should be treated as Iscopinidae **new status** within the Proctotrupoidea until such time as more material becomes available to shed light on the relationships of this wasp with other taxa.

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